

WHAT IS CLAIMED IS:

1. A filter device comprising:
 - a filter element that has a plurality of
5 piezoelectric thin-film resonators arranged in series
arms and parallel arms; and
 - a package that houses the filter element in a
face-down state,
the filter element and the package being
10 electrically connected to each other through bumps,
the package having a plurality of first pad parts
on which the bumps are placed, and a plurality of
transmission paths that electrically connect the first
pad parts to the outside,
 - 15 the filter element having a plurality of second
pad parts that are electrically connected to the first
pad parts through the bumps, and a plurality of wiring
parts that electrically connect the second pads to the
piezoelectric thin-film resonators and electrically
20 connect the piezoelectric thin-film resonators to one
another, and
 - inductances formed with the transmission paths
being connected in series to the piezoelectric thin-
film resonators.
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2. The filter device as claimed in claim 1,
wherein each of the wiring parts has a thickness
increased by an addition of a conductive layer.
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3. The filter device as claimed in claim 1,
wherein each of the second pad parts has a thickness
increased by an addition of a pad base layer.
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4. The filter device as claimed in claim 3,
wherein the conductive layers formed on the wiring
parts connecting the second pad parts to the
piezoelectric thin-film resonators are integrally

formed with the pad base layers.

5. The filter device as claimed in claim 3,
wherein the conductive layers formed on the wiring
5 parts connecting the piezoelectric thin-film resonators
to one another each has the same layer structure as
each of the pad base layers.

6. The filter device as claimed in claim 2,
10 wherein the conductive layers and/or the bump base
layers each has a double-layered structure.

7. The filter device as claimed in claim 1,
wherein each of the wiring parts has a length-width
15 ratio of 3 or smaller.

8. The filter device as claimed in claim 1,
wherein:
the piezoelectric thin-film resonators arranged
20 in series arms are aligned in a row; and
at least one of the piezoelectric thin-film
resonators arranged in parallel arms is placed on one
side of the row of the piezoelectric thin-film
resonators arranged in series arms, while the other
25 piezoelectric thin-film resonators arranged in parallel
arms are placed on the other side of the row.

9. The filter device as claimed in claim 1,
wherein the area of each of the first pad parts is one
30 to six times larger than the placement area of each
corresponding one of the bumps.

10. The filter device as claimed in claim 1,
wherein each of the first pad parts is connected to
35 each corresponding one of the second pad parts through
each corresponding one of the bumps.

11. The filter device as claimed in claim 1,
wherein the transmission paths are formed on a die-
attach face of the package.
- 5 12. The filter device as claimed in claim 1,
wherein at least 80% of the transmission paths are
formed on regions that do not face regions of the
filter element in which the wiring parts, the pad parts,
and the piezoelectric thin-film resonators are formed.
- 10 13. The filter device as claimed in claim 1,
wherein the package has glass ceramics as a main
component.
- 15 14. The filter device as claimed in claim 1,
wherein the line widths of the transmission paths are
in the range of 50 μm to 150 μm .
- 20 15. The filter device as claimed in claim 1,
wherein each of the transmission paths has copper or
silver as a main component.
- 25 16. The filter device as claimed in claim 1,
wherein each of the transmission paths has at least one
curved part.
- 30 17. The filter device as claimed in claim 1,
wherein the filter element has the piezoelectric thin-
film resonators arranged in a ladder-like fashion.
- 35 18. The filter device as claimed in claim 1,
wherein the filter element has the piezoelectric thin-
film resonators arranged in a lattice-like fashion.
19. The filter device as claimed in claim 1,
wherein the package includes:
a bottom part that holds the filter element in a

face-down state;

side wall parts that surround the filter element held on the bottom part;

conductive seal rings that are formed over the
5 side wall parts; and

a conductive cap member that seals a concavity formed by the bottom part and the side wall parts, with the conductive seal rings being interposed.

10 20. The filter device as claimed in claim 1, wherein the package includes:

a bottom part that holds the filter element in a face-down state;

side wall parts that surround the filter element
15 held on the bottom part;

conductive seal rings that are formed over the side wall parts;

a conductive cap member that seals a concavity formed by the bottom part and the side wall parts, with
20 the conductive seal rings being interposed; and

vias that penetrate the side wall parts from the bottom part to the conductive seal rings,

the transmission paths being connected to the conductive seal rings through the vias.

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